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The 2019 M6.4 Durrës (Albania) eq damage to infilled RC frames in correlation with shake table experiments

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Abstract

On November 26th 2019 the Mw = 6.4 earthquake struck the north-central Albania causing casualties and severe damage (IEMS = VIII) to the built environment, and in particular to the city of Durrës. This earthquake occurred not long after the Mw = 5.6 earthquake on September 21, 2019. In January 2020, the American Concrete Institute (ACI) Technical Committee 133 Disaster Reconnaissance task group inspected the damaged buildings in the city of Durrës. The primary goal was to observe the damage to masonry infilled RC frame buildings built after 1990's, designed and constructed in compliance with contemporary structural codes. The most distinguished was in-plane (IP) and out-of-plane (OoP) very heavy damage or destruction of masonry infill walls – local damage grades 4 or 5 – in compliance with EMS-98 scale. Damage to the RC frame structure was negligible to slight – local damage grades 1 or 2.

Key words: M6.4 Durrës (Albania) earthquake, damage survey, masonry infilled RC frame, correlation, shake table experiment

On November 26th 2019 the M_w = 6.4 earthquake struck the north-central Albania causing casualties and severe damage (I_{EMS} = VIII) to the built environment, and in particular to the city of Durrës. This earthquake occurred not long after the M_w = 5.6 earthquake on September 21, 2019. [1, 2] In January 2020, the American Concrete Institute (ACI) Technical Committee 133 Disaster Reconnaissance task group inspected the damaged buildings in the city of Durrës. The primary goal was to observe the damage to masonry infilled RC frame buildings built after 1990's, designed and constructed in compliance with contemporary structural codes. The most distinguished was in-plane (IP) and out-of-plane (OoP) very heavy damage or destruction of masonry infill walls – local damage grades 4 or 5 – in compliance with EMS-98 scale (Fig. 2). Damage to the RC frame structure was negligible to slight – local damage grades 1 or 2 (Fig. 1) [3].
The observed building performance matched the observations from shaking table tests on a large-scale three-story RC frame structure with masonry infilled walls. The model structure was built in compliance with EN 1998-1 provisions as moment-resisting frame by considering the medium ductility form of seismic construction detailing, and tested under the series of ground motion recorded at the Herceg-Novi station during the 1979 Montenegro earthquake [4, 5].

Figure 1. Observed slight local damages on RC elements

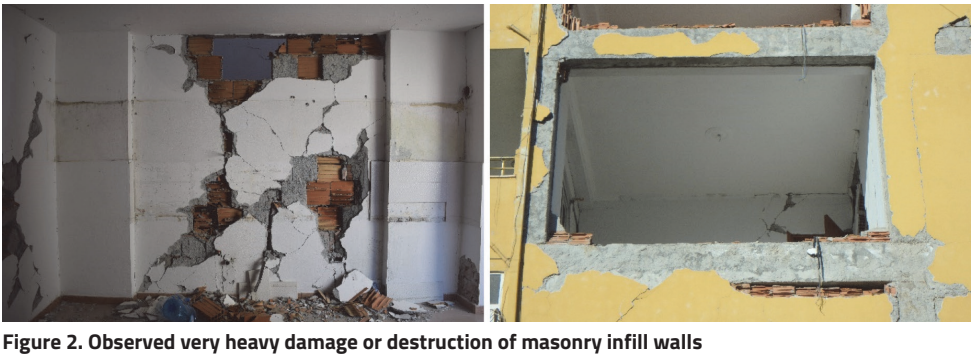

Figure 2. Observed very heavy damage or destruction of masonry infill walls

The macro-model, which considers the in-plane (IP) and out-of-plane (OoP) response as well as their interaction, was calibrated from test data [6-8] and used for the study of model structure performance under the series of ground motion recorded at the Durrës station during the November 26th 2019 Albania earthquake. The results are correlated with the actual damages observed after M6.4 Durrës (Albania) 2019 earthquake.

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